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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/007,332	11/08/2001	Andrew Marshall	TI-31484	3238

23494 7590 04/20/2005

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ART UNIT	**PAPER NUMBER**
2815	

DATE MAILED: 04/20/2005

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/007,332
Filing Date: November 8, 2001
Appellant(s): MARSHALL

Rose Alyssa Keagy
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed December 20, 2004 appealing from the Office action mailed September 20, 2004.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

The following is a listing of the evidence (e.g., patents, publications, Official Notice, and admitted prior art) relied upon in the rejection of claims under appeal.

Flaker et al.	(US Patent 6,133,608)	Oct. 17, 2000
Houston et al.	(US Patent 6,037,808)	Mar. 14, 2000

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 10-15 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 10 has been amended and states that bodies of matched transistors "are not tied to any fixed potential through a low impedance path." The specification is not enabling for the limitation because it does not mention that the bodies are not tied to any fixed potential. Furthermore, the specification does not mention a low impedance path and thus does not support the added limitation. It is shown in the specification that the bodies are totally isolated from other components or devices however it still does not mean that there can't be a potential tied to the body. It seems that if a source or drain is tied to a fixed potential, then the body of the transistor is also tied to a fixed potential. It is unclear how this is possible since there is no mention of such a limitation. For purpose of a prior art rejection, the examiner will interpret the limitation to mean that the body is isolated from other components. This interpretation will remain until evidence is shown in the specification that such a configuration is possible.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

Claims 6, 9, and 16-19 are rejected under 35 U.S.C. 102(a) as being anticipated by Flaker et al. (US 6,133,608).

In re claim 6, Flaker et al. shows (fig. 10B or 20) an integrated semiconductor-on-insulator circuit structure comprising a pair of transistors in a circuit stage which

requires matched behavior of said pair (col. 7, lines 15-24). and a physical connection of metallic material which provides thermal conduction between respective bodies of said pair of transistors (col. 4, lines 60-67). Flaker et al. does not specifically disclose that the circuit stage is an analog circuit stage. However, Flaker discloses that the invention is desirable in certain circuits such as a differential amplifier which is a type of analog circuit. A physical connection of metallic material which provides thermal conduction between respective bodies of said pair of transistors is disclosed in an alternative embodiment in which metal may be used instead of the silicon body link to provide connection between the two transistor bodies (col. 6, line 53 – col. 7, line 4). An insulating layer (48) is beneath said pair and an insulating barrier (69) substantially surrounding said pair extends to said insulating layer.

In re claim 9, Flaker discloses (col. 7, lines 1-4) that said physical connection comprises metal interconnects between said transistors of said pair.

In re claim 16, Flaker et al. discloses a method of circuit operation, comprising the steps of providing a pair of matched transistors, in a circuit stage which requires matched behavior of said pair (col. 7, lines 15-24) and providing a physical connection of material which provides thermal conduction between respective bodies of said pair of transistors (col. 7, lines 5-14) and surrounding said circuit stage with an insulating material (col. 6, lines 35-53).

In re claim 17, Flaker et al. discloses (col. 7, lines 5-14) that said physical connection is of a semiconductor material.

In re claim 18, Flaker et al. does not specifically disclose that the circuit stage is an analog circuit stage. However, Flaker discloses that the invention is desirable in certain circuits such as a differential amplifier which is a type of analog circuit.

In re claim 19, Flaker does not specifically state that said physical connection does not carry current during normal operation of said circuit stage. Flaker implies that the body link does not carry current because it is an undoped region of silicon material (col. 5, lines 1-10). Intrinsic silicon is a poor conductor of electricity. In order for it to conduct, an extremely high voltage would have to be applied to the silicon. Such a voltage is too high for typical FETs and would thus destroy them. Therefore, during normal operation, the body link (32) does not carry current. Furthermore, the combination of the isolation oxide (40 in fig. 10B) and the body link (32) resist punch through between adjacent diffusions (col. 5, lines 53-65) and therefore act as a barrier or blocking region.

Claims 10-13, and 15, as far as understood, are rejected under 35 U.S.C. 102(a) as being anticipated by Houston et al. (US 6,037,808).

In re claim 10 (as far as understood), Houston et al. shows (figs. 5a – 5d) an integrated semiconductor-on-insulator circuit structure, comprising a plurality of matched transistors in an analog circuit stage which requires matched behavior of said transistors (col. 9, lines 1-18) wherein respective bodies of said transistors are formed from different semiconductor sections (sections of transistors T4 and T5 in figs. 5a), said sections being formed on an insulating layer (Ox) and at least partially separated

by insulating material (see hash marks between sections of T4 and T5 in fig. 5a). The bodies are thermally coupled by a connection of non-insulating material (P-type body tie region BT in fig. 5a). Additionally, Houston discloses (col. 9, lines 8-18) that it is beneficial to not tie a potential to the bodies of the transistor.

In re claims 11 and 13, Houston discloses (col. 9, lines 35-43) that the bodies are electrically coupled by a connection of non-insulating material (P-type semiconductor body tie region BT in fig. 5a).

In re claims 12 and 15, Houston discloses (col. 17, lines 20-37) that the invention is used in an analog circuit stage which comprises a current mirror. The stage is a matched pair of current-sourcing P-channel transistors since figure 5a shows that the source/drain regions are n-type and the channel is p-type for both transistors T4 and T5).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Flaker et al. (US 6,133,608) as applied to claim 6 above, and further in view of Houston et al. (6,037,808).

In re claims 7, and 8, Flaker et al. shows all of the elements of the claims except the circuit stage being transistors in a current mirror. Flaker discloses that the invention having the body link is beneficial in differential amplifiers. Houston discloses (col. 17, lines 20-37) that a body tie is used in an analog circuit stage which comprises a differential amplifier having a current mirror. The stage is a matched pair of current-sourcing P-channel transistors since figure 5a shows that the source/drain regions are n-type and the channel is p-type for both transistors T4 and T5). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the matched transistor pair of Flaker by incorporating a current mirror because Houston teaches that current mirrors may also benefit from transistor matched pairs that use body ties.

(10) Response to Argument

The appellant primarily asserts that (1) claims 10-15 comply with 35 USC 112 because the specification discloses that a transistor body is left floating, (2) claims 6, 9, and 16-19 are patentably distinct from Flaker et al. (US 6,133,608) because Flaker does not disclose the metallic material providing thermal conduction, (3) that claims 10-13 and 15 are patentably distinct from Houston (US 6,037,808) because Houston does not teach transistor bodies thermally coupled by a connection of non-insulating material and that (4) Flaker and Houston do not show all of the elements of the claims The examiner believes that the rejections are still proper and that the cited references show all of the elements of the claims.

(1) In re the arguments concerning the 112 First Paragraph rejection, the examiner believes that the rejection is still applicable. The appellant cites page 1, line 12 of the specification to be the supporting paragraph for the limitation of the bodies of the matched transistor pairs "not tied to any fixed potential through a low impedance path." However, page 1, line 12 of the specification is part of the Background of the invention and pertains to the prior art. The specification only states that "transistor bodies are typically left floating." Although a floating body is not electrically connected to anything, the phrase "the bodies are not tied to any fixed potential through a low impedance path" implies that the bodies could be tied to a fixed potential through a high impedance path. When interpreted in that manner, the specification does not show support for the bodies being tied to a fixed potential through any impedance path because a floating body is not tied to any fixed potential at all. The examiner does not have problem with the bodies not being tied to any fixed potential, but limiting that tie to a low impedance path suggests that other impedance types may be used. This is why the specification does not show support. On page 3, line 13, the specification only states that the methods and structures have electrical isolation from external sources. However, such limitation may pertain to any component of the device. The examiner interprets that limitation to particularly mean that the devices are separated from other electrical devices, perhaps through isolation trenches. If the transistors are separated from each other by insulation, the bodies still may be tied to a fixed potential of a low impedance path. In essence, the cited lines of the specification don't really suggest the

specific limitation of bodies not being tied to any fixed potential through a low impedance path.

(2) In re the arguments against Flaker, the examiner believes that Flaker shows all of the elements of the claims. The appellant agrees that metals have both thermal and electrical properties but argues that some metals are more conductive than others, and thus it is assumed that Flaker's metal is not thermally conductive. That argument is erroneous because even if the tungsten metal of Flaker provides a small amount of thermal conduction as opposed to copper, the tungsten metal of Flaker still provides some amount of thermal conduction. The claims do not place limits on the amount of thermal conduction between the bodies of the transistor pair.

Flaker discloses specifically (col. 6, line 56-col. 7, line 4) that the SOI body link of the invention may be implemented as an alternative link in a logic circuit. Although this is a digital application, Flaker does not require the metal link to be formed only in the digital application. Flaker states exactly (in column 6, line 65-col. 7, line 4):

> "In addition, while the invention has been shown and described as using silicon for the conductive material of the selective link, it is to be understood that such conductive material may include any suitable conductive material such as metal, ..."

That statement only suggests that another modification can be made to the device wherein the silicon link of the analogue circuit stage is replaced with metal. Thus the metal link is still used in the analog circuit stage.

Flaker also does not teach away from providing thermal conduction between the respective bodies of the pair of transistors. Column 5, lines 49-65 of Flaker do not

mention anything about the extra oxide layer reducing the thermal coupling. Even if Flaker mentioned reduced thermal coupling of the bodies, Flaker would still inherently meet the limitations of the claims because the structure and materials are the same and there would be some type of thermal coupling (although reduced). Although the body charge differentials may occur due to outside thermal effects, the metallic link of Flaker would still provide thermal conduction because the materials and structure are the same as the instant invention. Flaker does not mention anywhere that the silicon link is thermally resistive or that thermal coupling is reduced. The column and line numbers mentioned by the appellant don't even remotely mention any type of teaching against thermal matching or coupling. The applicant merely attempts to overcome the cited art by emphasizing properties (ie. thermal conduction) of a know material (metal). The applicant has merely discovered an additional benefit of a known body link, the new discovery being that the transistor bodies are thermally matched as well as electrically matched. As for the rest of the arguments concerning the dependent claims, Flaker was cited with specific line and column numbers to teach every limitation.

(3) In re the arguments against Houston, the examiner believes that Houston shows all of the elements of the claims. Again, the appellant makes the primary argument that Houston also does not teach that the physical connection between bodies of transistors is not thermally conductive. And again, the examiner makes the counter argument that the materials and structure of Houston is the same as the instant invention and that for this reason, the physical connection of material recited in Houston

inherently provides thermal conduction. Furthermore, it is well known in the art that electrically conductive materials have thermal properties, some being better than others. But that argument is not persuasive simply for the fact that Houston uses a non-insulating and electrically conductive layer of silicon, just as the appellant does. The appellant's invention is not structurally or materially different from Houston and thus is not patentably distinguishable. As for the rest of the arguments concerning the dependent claims, Houston was cited with specific line and column numbers to teach every limitation.

(4) In re the appellant's arguments that Houston cannot be combined with Flaker because both references don't teach a physical connection of metallic material which provides thermal conduction between respective bodies of a transistor pair, the examiner believes that the combination is still proper. As stated in the rejection , Flaker already disclosed that the invention, including the metallic body link, is beneficial to differential amplifiers (col. 7, lines 15-25). Flaker was only deficient in specifically showing that the circuit stage was formed in a current mirror. Houston cured the deficiencies of Flaker by showing that the differential amplifier having the matched pairs of transistors was used in current mirror. Thus the combined references show all of the elements of the claims.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

MEW
MEW
April 16, 2005

Tom Thomas
TOM THOMAS
SUPERVISORY PATENT EXAMINER

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